AN EXTENDED VIRTUAL ELEMENT METHOD FOR ELLIPTIC PROBLEMS

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ABSTRACT

The VEM is a generalization of the FEM suitable to work on arbitrary polygonal meshes. Its main feature is that the basis functions of the variational formulation are defined implicitly as the solution of a relevant partial differential equation on each mesh element. Consider an elliptic problem whose exact solution displays a singular behavior. We can improve the numerical approximation of the exact solution by enriching the approximation spaces at the elemental level to capture such singular behavior, at least partially. In this talk, we discuss how to construct such virtual enriched spaces in a partition of unity framework and its preliminary application to solve elliptic eigenvalue problems. For such construction, we use the Wachspress basis functions that we locally define on every polygonal mesh. These additional basis functions form a partition of unity that incorporates the enriching function in a global conforming setting without altering the approximation order of the non-enriched virtual element space. This work stems from a collaboration with Prof. J. Droniou and Dr. L. Yemm (School of Mathematical Sciences, Monash University), and Prof. F. Gardini (Department of Mathematics "F. Casorati", University of Pavia).

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